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SUBJECT: Israel's Technology Sector: The Future at Risk

Introduction and Summary

¶1. (U) Israel's economy was fundamentally altered by the rise of a robust high-technology innovation sector over the past twenty years. The key factors contributing to its formation were strong national intellectual capital resources, state-supported innovation programs in the defense and non-defense sectors that generated tangible and intangible spin-offs, and an abundance of private sector capital resources (much of it foreign) speculating on Israeli ingenuity under pressure. The technology innovation sector now accounts for 20 percent of industrial output, directly engages over 10 percent of the workforce, and is responsible for a large share of economic growth. GOI ability to cultivate high-tech innovation growth and broaden it to other sectors was due to an effective national science policy, strong government investment in education, and fortuitous circumstances. Israel's economic future is now intertwined with the health of this major component of the economy, but is increasingly at risk from an eroding education system, underinvestment in intellectual capital, and growing competition from lower-cost R&D centers. Given the long lead-time education investments take to yield results, Israel's next government faces critical decisions with pivotal long-term consequences. End Summary.

The Data and the History

¶2. (U) Israel's success in the global high technology innovation market is remarkable: After companies based in the United States and Canada, Israel has more NASDAQ-listed companies than any other country. Israeli developers pioneered the technology that led to the internet, and several Israeli companies (Amdoxs, Comverse, Checkpoint) have become global names in their fields. Many major high-tech corporations (Motorola, IBM, Phillips, Cisco, Microsoft...) have big R&D divisions based in Israel. Intel employs over 6,400 Israelis at its research center in Israel, one of only three such centers worldwide. The technology innovation sector counting software, computer and IT components today accounts for 20 percent of industrial output, directly engages over 10 percent of the workforce, and is responsible of a large share of Israel's economic growth. High-tech industry exported $15 billion in products and services in 2006, accounting for nearly half of all export earnings. Israel records the fourth greatest number of patents per capita in the world, and claims to have the world's highest percentage of broad-band internet connection per population (30%). An analysis of global innovation centers in the Harvard Business Review of March 2009 ranked Israel third in the world, trailing only the US and Finland.

¶3. (U) The country's success in high technology, including microelectronics, bioengineering, software development, and telecommunications, is more assumed than analyzed. However, its advent was far from accidental. Until the 1990s Israel's economy relied on agricultural exports, the diamond industry, and a small but growing arms and defense equipment export sector for revenue. These were heavily supplemented by a tourism industry - subject to the vagaries of regional political tensions - and direct assistance from the USG and the global Jewish diaspora through Israeli bonds and other investment vehicles. During the 1990s, the advent of subcontracts to export civilian technology products forced companies to offer shares to the public in order to raise the funds for expanding production -- first in the small Tel Aviv capital market and later in New York. This drew the attention of emerging market specialists, who recognized the potential of the country as a civilian technology producer.

4 (U) What allowed Israel to make the transition from military technology innovation to civilian high-tech R&D was a fortunate combination of extraordinary intellectual capital resources, and a business culture that rewarded success against daring odds and did not punish failure. This fostered an entrepreneurial culture that, according to a 2008 OECD study, has become a principal factor in Israel's innovation economy. A 2007 global competitiveness survey ranked Israel first in terms of new business start-ups.

A Well-Tuned Science Policy

¶5. (U) The key ingredient that helped combine the intellectual resources and entrepreneurial business culture was a strong government science policy. This was composed of (1) heavy investment in the country's human capital, particularly during the mandatory military service of both men and women, (2) facilitating the spin-off of ideas and highly-trained personnel from the military into the civilian sector and academia, and (3) using publicly-supported incubators and other mechanisms to channel venture capital to innovative applications, resulting in a very high rate of business start-ups.

¶6. (U) Israel's intellectual capital derives from both official structures and cultural tradition. Academic study has long been an esteemed Jewish cultural value, and Jewish history is filled with icons of learning. Some attribute it to the minority status which often led to the persecution of Jews in diaspora society for 2000 years - intellectual property, unlike physical property could never be confiscated by expulsion or edict. Referring to themselves as "the people of the Book", Jewish tradition honors scholarship and the learned professions. This high cultural value placed on study provided a good foundation for a knowledge-based economy. Even before the state was created in 1948, Jews returning to British-held Palestine had made the country's educational institutions a priority, founding Hebrew University in 1918, with Albert Einstein delivering its first science lecture. Recognizing a dearth of civil engineers and architects to design and build a modern country, in 1923 the Technion-Israel Institute of Technology was also founded by early Zionist leaders.

Human Capital Paramount

¶7. (U) Government investment in the country's intellectual capital continues to play a critical role. Israelis place a high priority on education, which as a sector accounts for 10 percent of GDP. Education is one of the key responsibilities of the government, taking about 9 percent share of Israel's domestic budget, some 28 Billion NIS in 2008. Israeli secondary and tertiary education received enormous investments from 1960 through 1990, as the country built four new universities, to supplement the four existing ones, and expanded its capacity to meet the demands of a doubling population. Today, Israel has the third highest tertiary education attainment ratio in the world, after Norway and Canada. Significantly, nearly a quarter of all Israeli graduates are in the fields of science and engineering.

¶8. (U) Government investment in intellectual capital is strikingly demonstrated in Israel's military training programs. GOI military service is one of the unifying elements of Israeli society. Between the ages of 18 and 22, men and women are expected to serve in the military (men for three years, women for two), and may remain on

reserve duty for up to 20 years thereafter. It is an equalizer in society, obliging both rich and poor, native-born and immigrant, to serve the state - the major exceptions being the ultra-orthodox Jewish sector, which is now under increasing pressure to serve, and the Arab sector, which is also being pressed to perform some type of national service. Although it imposes a common obligation on Israelis, the GOI does not treat all recruits identically, using the opportunity to troll for the most academically talented youth and channel them into selective training programs.

¶9. (U) The Talpiyot program is the most elite of these, selecting 50 recruits per year for intensive three-year training in physics, computers and other sciences with an eye to cultivating tech-savvy

officers for the Israeli military. The graduates then serve six years in the military, not in combat but rather in roles tailored to meet the technological challenge of improving the Israel Defense Force's (IDF) effectiveness. Spurred by the shock of heavy losses in the October 1973 Yom Kippur War, the Talpiyot program was established with the recognition that each IDF soldier must be equal to seven of the enemy if the country is going to meet the challenges presented by its more numerous enemies. Since its creation thirty years ago, graduates of this program have contributed to Israeli security through innovations such as improved propulsion systems, better missile guidance systems, life-saving technologies such as drone aircraft and stronger vehicle construction. Beyond Talpiyot, the IDF also offers a more general university education option to IDF soldiers in exchange for an extended service commitment, and offers an impressive array of technical training programs to cultivate the skills it needs to win wars, from piloting fighter aircraft to repairing engines to designing advanced telecommunications systems.

¶10. (U) Although its primary mission was to create a techno-savvy future officer corps, the Talpiyot program's inadvertent secondary effect has been to feed a stream of high-powered engineers and innovators to the private sector. After finishing military service, Talpiyot graduates are snapped up by technology firms. Of the nerly 600 graduates over the life of the program, onl 25 have stayed in the IDF to attain its highestranks, while most move into commercial R&D and fund companies working on new technology. These irms benefit from both the personnel and the ideasthey bring with them. Anecdotal evidence points o a high percent of Israeli high-tech corporatios counting Talpiyot grads among their leadership An added benefit is the Talpiyot alumni connection, that encourages communication and cross-fertilization of hatching ideas among young companies, avoiding the stove-piping that hinders creative problems solving.

Channeling Capital Resources

¶11. (U) A second key method through which GOI science policy fosters innovation is facilitating the spin-off of ideas from military and academia into the commercial world. The government supports a series of incubator programs that help individuals with ideas develop them further into commercially viable applications. Principal among these is a program run by the Office of the Chief Scientist (OCS) of the Ministry of Industry, Trade and Labor, though other ministries have their own Chief Scientist offices with smaller research support budgets. Since 1991 the Trade and Industry OCS has funded technological incubators in Information and Communication Technology, life sciences, medical devices, water technology, and clean-tech that support fledgling entrepreneurs trying to turn innovative ideas into exportable commercial products and viable business ventures. These incubators provide physical premises, financial resources and professional and business guidance during the initial and most risk-prone phase of a start-up's business cycle. The OCS claims that after a year or two with state support, over 60 percent of the 11,000 projects it has assisted have successfully attracted private investment, and 55 percent of assisted projects were still active in R&D three years after "graduating." About 200 projects are currently in the program, which yields about 80 new start-up companies annually. Over the life of the program the OCS has cumulatively invested over $500 million, but has leveraged nearly $2.2 billion in private sector funds for these companies.

¶12. (U) To fully draw on the potential from its investment in

tertiary education, the GOI also encourages universities to assist their professoriate in converting new knowledge into marketable products. This assistance usually takes the form of a separate company, with the university as the unique shareholder, which offers incubator-type assistance to the institution's researchers, both professors and students. This assistance may include financial assistance, equity investment, and guidance on patent and copyright issues and business strategy. These companies, such as Hebrew University's Yissum, Technion's Yazamut, Tel Aviv's Ramot, and the Weizmann Institution's Pamot, operate independently of their parent university, but channel their financial proceeds to the institutions. Hebrew University claims such returns now account for about 10 percent of its R&D investment budget, and many of Israel's tertiary education institutions hope the licensing rights, inventions, and equity investments from their professors' and students' research will help cover the budget shortfalls of the future.

¶13. (U) Leveraging the private sector's resources through initial public offerings evolved as another facet of official science policy. In 1992, to help structure the emerging private venture capital market in Israel, the GOI created the Yozma Venture Capital Fund. Yozma (which is Hebrew for "initiative") was the tool for organizing and expanding the first stages of Israel's young venture capital market. One of Yozma's major purposes was to encourage local and foreign multinational investors to join forces in financing young, high risk Israeli firms. These early venture capital investments combined financial means with post-military Talpiyot talent, and resulted in companies such as Elbit Vision Systems-EVS (Elron), Gilat Satellites (AAV), Logal (Veritas), and Mercury Interactive (Athena). Cultivating and channeling capital to promising start-up companies was undertaken as a national policy, recognizing that fully utilizing Israel's intellectual capital can generate the exports, jobs and income of the future.

¶14. (U) Between government investment, investments by Israeli venture capital firms, and existing private sector R&D budgets, Israel records the world's highest R&D intensity at 4.65 percent of GDP, over twice the OECD average of 2.26 percent. According to the 2008 OECD Science, Technology and Industry Outlook, Israeli private sector R&D at 3.64 percent of GDP also outpaces all OECD countries.

A Future at Risk

¶15. (SBU) Despite its present image of strength, Israel's high-tech sector faces considerable challenges in maintaining its position in the future. The education budget has been cut in recent years, both in nominal and relative terms, due to the need to rein in government expenditures. This has aggravated a system already under strain, with the large impact on primary and secondary education visible in standardized test scores. In the 1960s Israeli students scored among the top in the world in science and mathematics testing; in 2006 Israeli pupils ranked 39th and 40th out of 57 countries in math and science. Israeli middle and high school teachers were on strike for about two months in 2007 over working conditions and pay; they earn half of the average OECD teacher's pay, and have over 30 students per class. So many teachers have left the profession that the GOI, trying to capitalize on the global high-tech downturn, signed up 1,000 unemployed engineers for a course of study to turn them into science and math teachers. Estimates of the need for new teachers to fill gaps and replace retirees in coming years range up to 10,000. Critics say the Education Ministry is a dysfunctional bureaucracy grossly inefficient at utilizing its massive budget; ironically this led to further budget cuts by the Knesset, rather than a serious attempt to fix the administrative problems. The persistent under-investment in basic education may have long-term ramifications on the country's competitiveness.

¶16. (SBU) Universities have also not been spared budget cuts, which have significantly reduced faculty size at most universities. Academic sources say one-third of all Israeli doctoral-level professors have chosen to teach abroad rather than accept the low salaries paid by the government-funded universities in Israel. In 2007-8 university professors and instructors went on strike for three months to protest low salaries and cuts in government support. Tighter budgets also have resulted in less prepared entering students. Without a stream of top-notch students from secondary

schools, universities fear that scholastic standards will fall, and the brainpower to fuel Israel's high-tech economy into the future will not be there.

¶17. (SBU) Another bad omen is a marginal drop in national R&D spending. OCS support for R&D was cut back in 2007 and 2008. University R&D investment dropped almost 2 percent across 2006 and 2007, as GOI funding for universities was cut back in the quest for a balanced national budget. The global economic recession also has severely impacted donor contributions to and the endowments of Israeli universities, and struck simultaneously with the substantial damage to Jewish philanthropy caused by the Bernard Madoff scandal. The Technion, for example, lost $25 million directly, and the American Technion Society (its alumni and benefactor arm) lost $72 million. Because government support for the universities covers only faculty salaries and overhead, most research and capital construction costs must be covered by corporate and alumni donations. As a consequence, numerous academic investment projects are being delayed or cancelled.

¶18. (U) Coincident with the self-inflicted blows to its long-term innovative capacity, Israel faces the new and immediate challenge of growing foreign competition from new research centers in the developing world. The capacity of India, China, and Brazil dwarfs that of Israel; over 800,000 engineers finished university in India and China in 2007, compared to only 8,000 in Israel. The ability of competitors to throw huge numbers of developers into a project poses a daunting challenge to Israel. Even smaller competitors like Singapore and Ireland are a threat, with their assured access to larger regional markets (China and the EU respectively), while Israel remains a virtual island. Just as the global economic center of production may be shifting toward Asia, so Israeli analysts say the globe's R&D capacity may be shifting away from the West. Employment costs, a key component, may be half as high in Asia as in Israel. Israelis also fear the strengthening of Israel's currency, the shekel, which in 2007-8 strengthened by 22 percent before falling back, and caused high-tech exporters a reported $690 million in lost orders during that period.

¶19. (SBU) Although the new government of prime minister-designate Benjamin Netanyahu may not be able to control the international competition the country faces, it will need to acknowledge and act on the great pressures building up in Israel to fix an under-performing education system and promote national R&D competence. Netanyahu's reputation as a serious financial manager - a legacy of what is widely considered to be his successful term as Finance Minister earlier in this decade -- may help him recognize the value of long-term investment in human capital and the short-term importance of pro-investor tax incentives to encourage competitiveness. Without serious attention to strengthening Israel's commitment to science education and investment, the country's future as a locus of diverse high-technology innovation will be endangered.

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